REMARKS

Claims 8-10 have been added. No new matter was added. Thus, claims 1 and 4-10 are pending in the present application. Applicant submits arguments for overcoming the rejections recited in the FINAL Office Action dated December 9, 2009. Accordingly, Applicant respectfully submits that the present application is in condition for allowance.

I. Claim Rejections - 35 USC §103(a)

A. In the FINAL Office Action dated December 9, 2009, claims 1 and 5 are rejected under 35 USC §103(a) as being obvious over JP 09-260139 A of Takeda et al. in view of a 1992 publication of Bates et al. and in further view of JP 09-316630 A of Watanabe et al.

Present Invention

Independent claim 1 of the present application is directed to a sputtering target made of a specified perovskite oxide ceramic material having high density and low electrical resistance. More specifically, the sputtering target is required to have a relative density of 95% or more and a resistivity of 10Ωcm or less. Claim 1 also requires the sputtering target to have an average crystal grain size of 100μm or less and a purity of 3N or more. New claims 8-10 further require the sputtering target to have a resistivity of 2Ωcm or less, a relative density of 98.4% or more, and an average crystal grain size of 50μm or less, respectively. No new matter was added; for example, see the first paragraph after Table No. 1 on page 5 of the present application, as filed.

In should be understood that direct current (DC) or radio frequency (RF) sputtering relates to a process including ionizing argon in thin gas (argon gas), colliding the created argon ions with the target, using the collision energy to discharge the target material, and adhering to a substrate such target material that reaches the substrate. Accordingly, a sputtering target must be

free of fractures and have a uniform structure to enable target material to uniformly adhere on a substrate. Fractures in the body of the sputtering target will cause the undesirable generation of micro-arcing during the sputtering process and the undesirable generation of particles. Thus, the sputtering target must have a dense structure so cracks will not occur during the sputtering process.

At the time the present invention was made, a sputtering target of the claimed perovskite oxide ceramic material and of a high density for depositing a thin film via a sputtering process did not exist. (See page 1, lines 26-28, of the present application, as filed.) When a conventional perovskite oxide ceramic material was used as a sputtering target, its density and strength were low and there were problems with fractures and cracks occurring during target manufacture, transfer of the target, and sputtering operations. (See page 2, lines 1-5, of the present application, as filed.) Further, such a low density sputtering target provides problems in that the unwanted generation of particles increase during the sputtering deposition process thereby deteriorating the quality of the thin films produced and increasing the amount of defective products. (See page 2, lines 1-5, of the present application, as filed.)

As best stated on page 2, lines 8-10, of the present application, as filed: "Therefore the improvement of density in this kind of ceramic material target existed as an ***extremely formidable challenge***."

Based on the inventor's significant inventive contribution, the present invention provides a sputtering target that inhibits the occurrence of fractures and cracks and inhibits the generation of particles during sputtering. Thus, the present invention greatly improves yield with respect to manufacture and use of the sputtering target and greatly improves the quality of the film deposited via sputtering and reduces the generation of defective products. The inventor

discovered that a desirable sputtering target can be made of a perovskite oxide ceramic material "by prescribing the substitution of the Ra site, subjecting this to hot pressing and sintering under an inert gas atmosphere, and thereafter performing heat treatment thereto in atmospheric air or oxidized atmosphere" (see page 2, lines 17-20, of the present application, as filed).

Not Obvious to Modify JP '139 based on Bates and/or JP '630

The primary reference, JP '139, discloses a ceramic material having a composition that is similar to the present invention (although not identical for reasons stated in Applicant's previous response). As readily admitted in the FINAL Office Action, JP '139 fails to disclose the requirements of independent claim 1 of the present application with respect to relative density, resistivity and purity.

Most importantly, JP '139 fails to provide any kind of description regarding density. According to the present invention, it is extremely important to improve (i.e., increase) the density of a perovskite oxide ceramic material sputtering target, and, if the density is low, such a sputtering target will likely crack or, in certain cases, break. In addition, there is a problem in that the undesirable generation of particles will increase during the sputtering deposition process, and the quality of the thin film produced will deteriorate. The sputtering target of the present invention having a relative density of 95% or higher is able to overcome all of the foregoing problems. As stated above, this is a sputtering target that could not be obtained conventionally.

Applicant respectfully submits that the Examiner has erred in interpreting that JP '139 "teaches a sputtering target". The Abstract of JP '139 merely recites the word "target", not sputtering target. Paragraph No. 0014 of JP '139 is directed to "a means to produce a perovskite compound" and clearly fails to provide any indication with respect to the type of the "target"

referenced in the Abstract. For this, one must study Paragraph No. 0018 and FIG. 1 of JP '139. Paragraph No. 0018 of JP '139 states that the "thin film was produced with the laser ablation method as shown in drawing 1." Thus, JP '139 discloses a laser ablation target employed in a deposition method that does not have to give consideration to the problems concerning the density of the laser ablation target.

Laser ablation and DC or RF sputtering processes are different technologies that employ completely different methods of adhering target material to a substrate. JP '139 clearly describes a laser ablation target and process. See Paragraph No. 0018 and FIG. 1 of JP '139. In general, laser ablation technology relates to rapidly heating and instantaneously vaporizing target material with a laser so as to adhere such target material to an opposite substrate. In contrast, as described above, direct current (DC) or radio frequency (RF) sputtering technology relates to a process including ionizing argon in thin gas (argon gas), colliding the created argon ions with the target, using the collision energy to discharge the target material, and adhering to a substrate such target material that reaches the substrate.

Independent claim 1 of the present application is limited to a "sputtering target" and does not read on a laser ablation target. A sputtering target must be free of fractures and have a uniform structure to enable target material to uniformly adhere on a substrate. Fractures in the body of the sputtering target will cause the generation of micro-arcing during the sputtering process and the generation of particles that are undesirable. Thus, the sputtering target must have a dense structure so cracks will not occur during the sputtering process. Independent claim 1 of the present application requires the "sputtering target" to have a relative density of 95% or more.

In contrast, the density of the laser ablation target of JP '139 for use in a laser ablation process (see Paragraph No. 0018 and FIG. 1 of JP '139) will not in any way affect the quality of the thin film to be deposited on the substrate during a laser ablation process. It will suffice as long as energy that is capable of instantaneously vaporizing the target material can be applied. In fact, one of ordinary skill in the art is aware that a lower density is preferred so that the laser ablation target can easily vaporize.

Accordingly, Applicant respectfully submits that it would not be obvious for one of ordinary skill in the art to modify the laser ablation target disclosed by JP '139 according to Bates, JP '630, or any other reference, since this would destroy the intent, purpose and function of the invention of JP '139. When a §103 rejection is based upon a modification of a reference that destroys the intent, purpose or function of the invention disclosed in the reference, such a proposed modification is not proper and a *prima facie* case of obviousness cannot be properly made. In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

Here, JP '139 is directed to a laser ablation target in which lower target densities are preferred so that the target material can be more easily vaporized with a laser. Making the laser ablation target dense defeats this purpose and makes the target more difficult to vaporize. Of course, increasing the relative density to extremely high values of 95% or more or 98.4% or more would certainly be avoided by one of ordinary skill in the art producing a laser ablation target.

Still further, JP '139 teaches away from a target of high density. This is because JP '139 teaches a laser ablation process which inherently requires a target of lower density than a sputtering target. "Teaching away" is the antithesis of the art suggesting that the person of ordinary skill in the art go in the claimed direction. Essentially, "teaching away" is a per se

demonstration of lack of obviousness. In re Fine, 873 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

For at least the above reasons, Applicant respectfully submits that claims 1 and 5 of the present application are patentable and are not obvious over JP '139 in view of Bates and further in view of JP '630. Accordingly, Applicant respectfully requests reconsideration and removal of the rejection.

In addition to the above reasons for patentability of claims 1 and 5, Applicant also submits that the Bates publication also fails to disclose a sputtering target. Bates relates to producing a sintered compact with a method (GNP) that is clearly different from the method disclosed by the present application, as filed. In particular, the disclosure of "fine powder (20-50nm)" being sintered "in the atmosphere" is different from the present invention. As conceded in Bates, if the production method is different, the electrical properties will also become different. Accordingly, it would be erroneous to acknowledge that the electrical properties of Bates are of the same level as that required by claim 1 (and new claim 8) of the present application. Further, Bates discloses technology related to the solid electrolyte of fuel cells, and the electrical properties thereof are designed and adjusted so that their functions can be exhibited. Meanwhile, the present invention is not used for the purposes described in Bates. Accordingly, there is no motivation in JP '139 as modified according to Bates for setting the electrical properties to be the same specific resistance as required by claims 1 and 8 of the present application.

Turning to JP '630, it describes a BaSrTi oxide classified as a "2+B4+0 type" perovskite structure. This crystal structure is clearly different from the "A3+B3+0 type" of the present invention. Of course, one of ordinary skill in the art would clearly understand that materials

having a different crystal structure will naturally have different attributes such as density, purity, crystal grain size, specific resistance and the like.

Although JP '630 may refer to density and purity, these attributes cannot be diverted directly to the present invention because the present invention has a different crystal structure. Even of greater importance, it would be inappropriate and unobvious to one of ordinary skill in the art to divert the foregoing attributes of JP '630 to the materials of JP '139 and Bates which have different crystal structures and different compositions. Accordingly, Applicant respectfully submits that one of ordinary skill in the art would not modify JP '139 based on either the teachings of Bates or the teachings of JP '630. It should also be noted, with respect to JP '630, that JP '630 only discloses the grain size of the "raw material powder" and fails to disclose the grain size of the "target."

Although sputtering targets are often formed by way of sintering, since the difficulty of sintering will differ depending on the material, sputtering targets are hardly ever produced under the same conditions just because they are a "target." In fact, the production method of JP '630 differs from the method of producing the sputtering target of the present invention; for instance, it does not include the heat treatment process of the sintered compact. Accordingly, as long as the production method is different, it would be inappropriate to assume that the target density and like physical characteristics will be the same or inherent in the material.

For all the above stated reasons, Applicant respectfully requests reconsideration of the references and rejection and submits that claims 1 and 5 are patentable over JP '139 in view of Bates and further in view of JP '630. Accordingly, Applicant respectfully requests removal of the rejection.

B. *In the FINAL Office Action dated December 9, 2009, claims 4, 6 and 7 are rejected under 35 USC §103(a) as being obvious over JP 09-260139 A of Takeda et al. in view of a 1992 publication of Bates et al. and in further view of JP 09-316630 A of Watanabe et al. and still further in view of the 2002 publication of Fiebig (Dortmund University).*

The Fiebig (Dortmund) publication discloses a ceramic material. It is cited merely with respect to the compositions required by claims 6 and 7 of the present application.

Applicant respectfully submits that independent base claim 1 is patentable and non-obvious over JP '139 in view of Bates further in view of JP '630 and still further in view of Fiebig for the same reasons stated above with respect to the rejection based on JP '139 in view of Bates and further in view of JP '630.

Accordingly, Applicant respectfully requests reconsideration and removal of the above stated rejection of claims 4, 6 and 7.

II. Conclusion

In view of the above amendments and arguments, Applicant respectfully submits that the rejections cited in the FINAL Office Action have been overcome and that the present application is in condition for allowance. Thus, a favorable action on the merits is therefore requested.

Please charge any deficiency or credit any overpayment for entering this Amendment to our deposit account no. 08-3040.

Respectfully submitted,
Howson & Howson LLP
Attorneys for Applicants

By /William Bak/
William Bak
Reg. No. 37,277
501 Office Center Drive
Suite 210
Fort Washington, PA 19034
(215) 540-9216